National Bureau of Standards

TECHNICAL NEWS BULLETIN

MARCH 1946 No. 347

International Council of Scientific Unions

Word has been received from Prof. F. J. M. Stratton, general secretary of the International Council of Scientific Unions that a meeting of the Council's General Assembly will be held in London on July 22–24, 1946. The Executive Committee has already held a meeting at which Dr. E. V. Hill, foreign secretary of the Royal Society, emphasized the fact that "science in its own interest must remain an international concern," and that "the future of civilization itself depends upon the close cooperation of scientific men throughout the world."

The International Council, originally known as the International Research Council, came into existence shortly after World War I. Its task was the creation of unions covering the various fields of science. The majority of the members of the Executive Committee of the Council are the representatives of these unions which now largely control the Council's activities.

Prior to World War II the International Union met in general assembly about once in 3 years, and between these meetings its work was conducted by committees, 92 of which have been reported, their activities covering a varied field of knowledge. In addition to the unions, there are a number of International Congresses that meet from time to time in different countries, but these have no continuity of existence between meetings. It is hoped that an organization can be set up that will take care of requests for assistance or advice in the fields of the congresses that are received when they are not in session. Joint commissions of the unions have been active for over 20 years, as for instance, the Joint Commission on Latitude Variation, and new ones are planned. Several of these were proposed at the recent meeting of the Executive Committee, and it is hoped that the cooperation of the International Congress of Applied Mechanics can be secured in this work.

In addition to the joint commissions between the unions that the Council helps to arrange, the latter also appoints committees of its own on various subjects, such as the Committee on Science and Social Relations, which was appointed in 1937. Reports were being received concerning the work of this committee during the years 1938 and 1939 and it was hoped that they could be published, but this program was interrupted by the outbreak of the war. Some of this material is now only of historical interest, but the committee has been asked to prepare a survey of the published views of scientific bodies on the current problems arising in connection with researches into such matters as nuclear physics and drugs. Such a survey "may enable the Council to make a reasoned pronouncement supported by the full weight of international science on the ethical problems which face scientific men in particular today," thus accepting the challenge offered by Dr. Hill to the Executive Committee.

The Council is linked by convention to the International Organization for Intellectual Cooperation of the League of Nations. The fate of this organization is uncertain, but there has come into existence the United Nations' Educational, Scientific, and Cultural Organization. At the recent conference at which this organization was set up, a resolution was adopted on the proposal of the United States delegation, asking the Preparatory Commission to invite its executive committee to examine, with the International Council of Scientific Unions, such methods of collaboration as might seem practicable to strengthen the programs of the two organizations. The Executive Committee of the Council has appointed a subcommittee to consult with representatives of the United Nations organization and it is hoped that both bodies will benefit from this discussion. The Bureau is represented in several of the unions and congresses and is heartily in favor of a resumption of their valuable cooperative work.

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Standard Color Cards

Since its formation during the First World War, the Textile Color Card Association of the United States has performed a color-forecasting service and color-standardizing service for the textile and allied industries. The first of these services enables the textile manufacturer, dyer, and dyestuff producer to plan his production with confidence that his choice of colors will dovetail satisfactorily with that for merchandise from other industries serving the fashion trade. The second service makes it possible for the standard color name always to

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signify the same color. The Standard Color Card of America, Ninth Edition 1941, issued by the TCCA, is widely distributed among textile manufacturers; and the most convenient and widely used method of making sure that a textile is the right color is by reference to this card. The colors of other materials are often controlled by reference to the Munsell Book of Color, or by special color standards, such as the United States Army Color Card issued by the TCCA for the Quartermaster General. All nonfluorescent material color standards may be interrelated by calibrating them on the fundamental basis afforded by spectrophotometric measurement.

The fundamental calibration of the widely used Standard Color Card of America, and the United States Army Color Card, has been completed at the Bureau. The complete results of this calibration, together with an account of the methods used, will appear in RP1700 by Genevieve Reimann, Deane B. Judd, and Harry J. Keegan in the March number of the Journal of Research. The calibration has been carried out partly by means of the spectrophotometer and partly by colorimetric comparison with the nonfluorescent Munsell color standards already calibrated. The results will permit procurement agents, both Federal and private, to extend conveniently their use of the TCCA color standards wherever applicable to requirements now stated in Munsell terms or terms of other fundamentally calibrated standards. Furthermore, from this coordination, it will be immediately evident how to specify the colors of nontextile objects, plastics, vitreous enamels, and so forth, when it is necessary that they match textile colors now specified by reference to the TCCA cards.

Reading Spectrophotometric Curves

Twenty years ago the fundamental calibration of a color standard was a tedious 4-hour task on a visual spectrophotometer. The design and production of the automatic recording photoelectric spectrophotometer by the General Electric Co. has done much to speed up this fundamental calibration, but has introduced problems of its own. This recording instrument draws its own curves, which then must be read visually in order to complete the calibration of the color standard. When hundreds of curves have thus to be reduced to numbers by application of zero corrections, one-hundred-percent corrections, and wavelength-scale corrections, the need for an optical aid to reduce eyestrain becomes acute. A device to facilitate the reading of spectrophotometric curves has been developed by Genevieve Reimann of the Bureau and E. J. Carmine of the Davis Instrument Co., Baltimore, Md. Eyestrain is reduced by bringing together magnified images of the reflectance scale, the wavelength scale, and the curve to be read, together with tabulated values of the wavelength-scale corrections. In this way many transverse and vertical movements of the eyes, ordinarily required to read the spectrophotometric curve, are eliminated.

TECHNICAL NEWS BULLETIN

U. S. Department of Commerce
Henry A. Wallace, *Secretary*

National Bureau of Standards
E. U. Condon, *Director*

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Infrared Transmission Curves of Pure Hydrocarbons

In connection with a program of infrared spectroradiometric research, the Radiometry Section of the Optics Division, has recently installed and placed in operation a Perkin-Elmer infrared spectrometer. A feature of this program, which was inaugurated last January, is to supply transmission curves of the pure hydrocarbons being prepared by F. D. Rossini under American Petroleum Institute Project No. 44. Six such curves were recently completed and the same number are in preparation.

The equipment in use is provided with a General Motors amplifier and Brown recorder. A special feature, designed and constructed in the Bureau's laboratory, is a drive mechanism for continuously changing

the slit width during the scanning of the spectrum to give an essentially constant energy output. The present equipment with rocksalt optics covers the range from 2 to 15 microns. A second instrument being ordered will be fitted with potassium bromide optics to extend the range to 25 microns. Progress is being made on the construction by the Bureau's Instrument Shop of a research type instrument that will incorporate either one or two prisms, 11 by 15 centimeters in height and width. The apparatus is being operated by E. K. Plyler and R. Stair, of the Radiometry Section.

Heats of Formation, Hydrogenation, and Combustion of Hydrocarbons

In the March number of the Journal of Research (RP1702), Edward J. Prosen and Frederick D. Rossini, of the Bureau's Section on Thermochemistry and Hydrocarbons, present a report on the heats of formation, hydrogenation, and combustion of the monoolefin hydrocarbons. For ethylene, propylene, the 4 butenes, the 6 pentenes, and the 17 hexenes, and all the higher 1-alkene hydrocarbons, in the gaseous state at 25° C, selected "best" values are given for the heats of formation (from the elements, solid carbon (graphite) and gaseous hydrogen), the heats of hydrogenation in the gaseous state, and the heats of combustion (in oxygen to form gaseous carbon dioxide and liquid water). The values for 2 of the pentenes, 14 of the 17 hexenes, and all the higher 1-alkene hydrocarbons, were calculated by a method involving correlation of the heat of hydrogenation with structure and the use of constants evaluated from the available experimental data on 4 butenes, 4 pentenes, 3 hexenes, and 1 heptene.

Analysis of Standard Sample of Carburetted Water-Gas

The Journal of Research for March contains a report (RP1704) by Martin Shepherd on the analysis of a standard sample of carburetted water-gas by 24 laboratories in cooperation with Subcommittee VII of Committee D–3 of the American Society for Testing Materials. The data are presented in a series of frequency-distribution plots, which show at a glance how the analyses compare with respect to each component of the gas mixture, as well as the calculated heating value and specific gravity. These plots form a clear picture of this type of gas analysis in this country. Although some very creditable work was reported, the need for some standardization is evident.

Electronics Section

In order to broaden the scope of the work of the Bureau's Ordnance Development Division, an Electronics Section has been set up to handle projects involving electronics research and engineering, not necessarily related to ordnance devices.

The work of the new section includes electron tube research and development, application of electronic circuits, and radiation. These projects are at present supported largely by transferred funds from the Army Ordnance Department and Navy Bureau of Ordnance but it is expected that new projects will accrue to the Section under the sponsorship of civilian agencies of the Government, so that it should become the Bureau's center for general development work in applied electronics.

An electronic instrumentation service is being offered by the Electronics Section. This service aims to assist the entire Bureau in the development, design, or specification of measuring and control equipment employing electron tubes. It is believed that this service by experienced personnel will prove of value in assuring full use of the advantages afforded by electronic instrumentation.

Robert D. Huntoon is in charge of the new Section. Dr. Huntoon has served in various capacities in the Ordnance Development Division since 1941, and during 1944–45 was attached to the War Department as Expert Consultant to the Secretary of War. He performed his doctoral work at the University of Iowa, receiving his degree in 1938, after which he taught nuclear physics at New York University and engaged in research work on electron tubes at Sylvania Electronic Products.

Printed Electric Circuits

A new technic in circuit wiring, originally pioneered by the Centralab Division of Globe Union Inc. and perfected for application to radio proximity fuzes is described in an article by A. S. Khouri and Cledo Brunetti, of the Bureau's Ordnance Development Division, that is to appear in the April number of "Electronics." This technic promises to be widely used in miniature radios, hearing aids, and electronic control circuits. It consists of printing circuit wiring, using silver paint, onto a chassis of steatite, spraying resistor material onto the plate, and soldering small disk-like capacitors to the plate. Suitable masks are used to position the sprayed components. A carbon and resin mixture is used for the resistors. The result is the practical elimination of the third dimension from certain types of circuit wiring and the production of a subminiature compact form that can be produced at high speed without errors in wiring.

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Radio Time Service

At a conference on January 11, between members of the staffs of the Naval Observatory and the Bureau, a notable step forward was taken in providing accurate time service to the nation.

The basic astronomical observations, which, by definition, fix time by reference to the passage of certain stars, are normally made in terms of the readings of astronomical type precision pendulum clocks maintained at the Naval Observatory. The standard emissions of radio frequency from station WWV of the Bureau are based on a group of quartz-crystal oscillators that maintain their period of vibration with exceedingly high accuracy.

With the new arrangement these oscillators serve, in conjunction with the pendulum clocks, to bridge over the intervals between the time the stellar observations are made and the time for the emission of the standard radio time signals. Observational and experimental irregularities are thereby smoothed out to a large extent, and as a result the signals broadcast by the Navy Department have been much less variable from day to day since the new plan became effective.

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Ionosphere Disturbance Warnings

During January a new service was added to the radio emissions from the Bureau's station, WWV. This is the broadcasting of warnings of expected disturbances in radio propagation conditions. If a warning has been issued that radio propagation disturbance is anticipated or is in progress over the North Atlantic path, the time announcement on WWV is followed by the sending of six "W's". If conditions are quiet or normal, the time announcement is followed by eight "W's".

Lightning Hazards to Nonmetallic Aircraft

The usual all-metal airplane constitutes an electrical shield that gives almost complete protection to its contents. Hundreds of cases are on record where such craft have been struck by lightning without serious damage. On the other hand, the operation of a wood or plastic craft in a thunderstorm involves a most serious hazard. Early in the war the shortage of aluminum made it appear likely that large numbers of plywood airplanes, such as the famed British "Mosquito" bomber would be used, and that it might be tactically necessary to tow large fleets of wooden gliders through the thunderstorm-ridden air of the Southwest Pacific.

The permanent Committee on Lightning Hazards of the National Advisory Committee for Aeronautics, the Government agency charged with responsibility for this field, anticipated such developments and needed answers to such questions as:

Is it impracticable to provide insulating barriers to prevent the lightning stroke from reaching and injuring the craft and its personnel and contents?

If so, can electrical conductors and metallic shields be so disposed as to lead the discharge harmlessly around personnel?

How many such lightning conductors are needed on a nonmetallic airplane or glider so as to transform it from a condition in which the personnel are certain to be electrocuted to one of reasonabe safety?

What material, location, and shape of conductors will give adequate protection with a minimum of weight and a minimum of manhours in their application and maintenance?

If the lightning conductors are pared to such a minimum to save weight, that the pilot may experience a slight shock in spite of their partial protective effect, how much current can a man endure for a few millionths of a second without being incapacitated?

If a glider is towed in the vicinity of a thunderstorm, how much current will flow in the tow line from the St. Elmo's Fire that develops on the aircraft under such circumstances?

Will this current be so great as to burn or melt the nylon tow line?

If so, how can such a disaster be prevented?

Is it wiser to use a nylon line and hope that it remains electrically insulating even when dragged through a wet cloud or to use a metal line that can easily carry the St. Elmo current but which increases the likelihood that the tow will trigger off a lightning stroke?

If a metal tow line is used, how large and heavy must it be if it is not to be fused by a direct lightning stroke?

Will the lightning currents weaken or melt the rudder control cable if they arc to it or flow in it?

Under the sponsorship of the Bureau of Aeronautics, Navy Department, and with the cooperation of the National Institute of Health, the staff of the High-Voltage Laboratory of the National Bureau of Standards carried out a series of laboratory experiments extending over 2½ years. In this process the large fund of information concerning natural lightning, which had been collected previously by scientists and by the engineers of electric power companies, was of great value. The experimental work involved such procedures as supporting an entire airplane from a string of insulators and measuring the current dissipated from its extremities as St. Elmo's Fire when it was charged to a potential of 1,000,000 volts; sending momentary currents up to 100,000 amperes through strips of copper and of aluminum and through bands of sprayed metal deposited on plywood; the sending of momentary currents up to 5 amperes through the forearms of volunteers from the laboratory staff and of even lethal surges of current through anesthetized guinea pigs.

The resulting series of reports that were made available to the sponsors of the project give engineering answers to the above and similar questions, and provide a firm foundation for the future possible development of lightning-proof plastic aircraft. These reports were recently declassified and are obtainable from the National Advisory Committee for Aeronautics, Washington 25, D. C.

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High-Temperature Ceramic Coatings

The compositions and technic of application of the Bureau's ceramic coatings for steel exhaust systems and other high-temperature service conditions were kept in a confidential status during the war. On that basis the information was given to about 25 companies, some of which applied the coatings in regular production for the armed services, whereas others placed themselves in position to do so on short notice. Still another group of these manufacturers either supplied materials to the companies applying the coatings or equipped themselves to do so.

Since the end of the war, the Secretary of Commerce has taken the necessary action to have the United States Patent Office remove the pending patent application on these coatings from its secret status. All of the companies that had received this information, under agreement to keep it confidential until its release, were notified that it had been declassified.

Several manufacturers have made inquiries concerning the use of these coatings on peacetime products, such as selected parts of stoves and kitchen ranges, and in some cases production has begun. During the past month one manufacturer sent a set of burners and grates to the Bureau with the request for a trial application of suitable coatings. After some experimenting two coatings were selected, and several of the articles finished in each of these coatings were returned to the manufacturer. One of the coatings applied was typical of those used on exhaust systems of military vehicles during the war, and another was very finely ground and fired in such manner as to produce a rather glossy coating, resembling the conventional porcelain enamel, but much thinner and more resistant to thermal shock. The manufacturer plans to test these coatings and advise the Bureau of his results.

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Special Porcelains

A conventional pottery body is a very complex structure of crystalline silicates in a matrix of glass. This glass does not have a sharply defined fusion point but will soften, and deform under stress, at temperatures much lower than those at which the crystalline phases of the body liquefy. For high strength, particularly at elevated temperatures, a glass-free body of simple composition and preferably of fine crystalline structure is desired. With this in mind, an investigation of special porcelains was undertaken at the Bureau under the general direction of R. F. Geller, and a preliminary report was published in 1941 (J. Research NBS **27**, 555 (RP 1443)). The second report, covering binary and ternary combinations of MgO, CaO, BaO, BeO, Al_2O_3, ThO_2, and ZrO_2, will be published in the March number of the Journal of Research RP1703.) The work includes a limited study of phase relations.

Phase studies of the system MgO-BeO-Al_2O_3 indicated a small field for the compound $BeAl_2O_4$ (chrysoberyl) and also a small field for a ternary compound of undetermined composition. The lowest fusing ternary eutectic, having the mole composition $4MgO:4BeO:Al_2O_3$ fused at 1,640° C. No ternary compounds were found for the systems BeO-Al_2O_3-ThO_2 and BeO-Al_2O_3-ZrO_2. In the former, the lowest fusing ternary eutectic is indicated to be near the mole composition $4BeO:2Al_2O_3:ThO_2$, fusing at 1,795° C, and in the latter, at the mole composition $2BeO:Al_2O_3:ZrO_2$ fusing at 1,750° C.

None of the compositions of BeO-Al_2O_3-ZrO_2 investigated could be vitrified. However, vitrification was attained by using minor additions of other oxides (such as MgO or CaO), and minor oxide additions also improved the vitrifying behavior of several combinations in the BeO-Al_2O_3-ThO_2 system.

The most important results were obtained with the three oxide combinations of MgO–BeO–Al_2O_3 and BeO–Al_2O_3–ThO_2. Strengths in compression in excess of 250,000 pounds per square inch were attainable at room temperature. Bodies composed principally of BeO showed electrical resistance, and also thermal conductance, appreciably greater than for conventional porcelains, and also better than the high-alumina porcelains used as insulators in commercial spark plugs. In engines using fuel containing tetraethyl lead, the spark-plug insulators are exposed to lead oxide vapors. Tests for resistance to attack of lead oxide (PbO), both as liquid and vapor, showed least resistance for siliceous commercial bodies and greatest for the high-BeO specimens. Dielectric properties for several compositions are promising; the dielectric constant ranged between 6 and 8, and some compositions showed power-loss values, at 100 kilocycles per second and room temperature, of less than 0.01 percent.

Compositions of high BeO content could be alternately heated and cooled as many as 10 times to and from 925° C, and in an air blast, without measurable loss in cross bending strength. Also, modulus of rupture determinations at 980° C, using specimens approximately $\frac{5}{8}$ inch by $\frac{3}{16}$ inch in cross section, centrally

loaded across a 4½-inch span, showed strengths for the most promising bodies ranging from 12,000 to 17,500 pounds per square inch.

Wearing Quality of Experimental Currency-Type Papers

In Technical News Bulletin 343 (November 1945) the investigation conducted in cooperation with the United States Treasury Department on currency-type papers was briefly described. As the complete report of this work will appear in the March Journal of Research (RP1701) by Frederick T. Carson and Merle B. Shaw, it seems worth while, even at the expense of some repetition, to give a more detailed résumé at this time.

The object of the work was to improve the quality of currency paper and to study possible substitutes for linen fiber, the supply of which was at that time threatened by the war. Using the Bureau's semicommercial mill, a considerable number of papers were made from various fibers, including linen, cotton, caroa, sisal, and several types of wood fiber, all of which are regularly used in the manufacture of high-grade papers. There were 14 groups of the experimental papers, some of which contained but one kind of fiber, whereas others contained mixtures of two kinds. Portions of the papers were surface-sized with glue, which was tanned or hardened with alum or formaldehyde. Some of the papers contained melamine resin to improve their surface and to increase their strength when wet.

The papers were given the usual tests: thickness, areal weight, folding endurance, bursting strength, tensile strength; stretch at failure, resistance to tearing, opacity, acidity, and permeability to air, water, and oil. In addition, some tests of wearing quality were made, including crumpling the paper to simulate wear in service, and subsequent evaluation of the wear, and also surface wear or scuffing of the paper, both when dry and when wet.

The tests indicate that surface sizing improved most physical properties, but that it made the paper somewhat easier to tear. A similar effect was produced by melamine resin added while the paper was being made. The use of both melamine resin and glue surface sizing nearly doubled the strength, and increased the wearing quality two to threefold, but reduced by about a third the resistance to tearing. Melamine resin greatly increased the strength of the papers when wet, and substantially improved the wearing quality of the surface. It had little effect, however, on opacity, permeability to water and oil, or dimensional variations that result from change in the humidity of the surrounding atmosphere.

The strength, toughness, and wearing quality of these experimental papers indicate that the most promising substitutions or additions (yielding papers comparable to that now used for paper currency) would be more cotton fiber, some caroa fiber, and the addition of melamine resin.

Lithographic Papers

The application of a technic that was successfully used in the development of paper for war maps is involved in a basic study of lithographic paper now in progress at the Bureau. Paper is a thin felting of fibers normally held together by invisible bonds of a water-sensitive gel formed on the fiber surfaces by mechanical beating of the fibers in water. Substitution of insoluble bonds of synthetic resin for the gel bonds promises to lead to important advances in printing papers, particularly those for multicolor offset lithography. The objectives of the present study include the conservation of basic raw materials by permitting the increased use of widely available short-fibered pulps, and improvement in the performance of papers in printing.

By the experimental manufacture of papers in the Bureau's semicommercial mill, information is being obtained on (1) the extent to which papers of the usual fiber compositions can be improved as regards expansion, curling, and linting by resin bonding instead of gelatinization by beating, (2) the possibility of using a greater proportion of short resilient fibers that improve printing qualities, but do not develop suitable sheet strength by gelatinization, and (3) the feasibility of making lithographic papers wholly or in part from newly developed deciduous wood pulps for better utilization of our National wood resources. Preliminary results have indicated great potential value of the resin bonding.

This investigation is a resumption of cooperative work with the Lithographic Technical Foundation that was interrupted by the war. As before, the Foundation has set up an advisory committee comprising representatives of the lithographic printing industry and of the manufacturers of paper and raw materials for paper. The advisory committee not only serves to guide the work but also is in a position to put the findings into immediate practical use.

Strength of Molded Phenolic Parts

Most of the available data on the strength of molded phenolic plastics have been obtained with standard test specimens and standard methods of test. Specific data of this type, obtained in accordance with test methods established by the American Society for Testing Materials, are published in manufacturers' data books. These sources acknowledge that a "molding material, which on standard test pieces appears superior, may show up in actual production as being even inferior to another material which on standard test pieces reveals a lower order of desirable properties." They attribute these discrepancies to such factors as peculiarities in mold design, size and shape of the molded article, and variations in molding conditions, but not to inherent differences in the materials or to selective characteristics of the standard test specimens.

An investigation of the nebulous region between

standard test and structural performance of molded plastics has been conducted at the Bureau for the National Advisory Committee for Aeronautics. It was observed that nonuniformity of a material affects the results of tests made with specimens of different sizes and with different methods of loading. The strength values were found to depend on the relationship between the size and shape of the molded specimen and the size and shape of the fillers. The most significant variations observed within a diversified group of materials were found to depend on the orientation of fibrous fillers. Of secondary importance was the dependence of the variability of test results on the size of the filler particles incorporated into the molding powder, as well as on the size of the molded piece. It is interesting to note that the trends observed in this investigation for the behavior of standard plastic test specimens agree qualitatively with conclusions derived from statistical analysis of the effects of dimensions and methods of loading upon the strength properties of concrete beams.

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Reinforcement of Holes in Thin Metal Plates

The stressed skin cover of airplane wings and fuselages has to be perforated by holes at a number of points to give access to the interior. These holes must be reinforced to prevent weakening of the entire structure. An ideal reinforcement would be one that confines the disturbance in the "stress flow" to the immediate neighborhood of the hole, and which at the same time adds the minimum of weight.

Too little is known about reinforcements to approximate this ideal in practice. Instead, it has been customary to reinforce holes by circular doubler plates riveted to one side of the sheet, thereby increasing the effective thickness and rigidity of the sheet at the edge of the hole.

At the request of the Navy Department a study was started at the Bureau to provide a better understanding of reinforcements around holes and to indicate practical improvements in their design. The study, which was conducted by Samuel Levy, Albert E. McPherson, and Frank C. Smith of the Engineering Mechanics Section, was started by an analytical investigation of reinforcements of various shapes, including doubler plates, around a circular hole in a plate under uniform tension in all directions. The study indicated that a given weight of reinforcing material was most effective when crowded close to the edge of the hole. The same conclusion was reached in an analysis in which a plate with a circular hole reinforced with circular doubler plates was assumed to be subjected to tension in one direction and to shear.

The analysis assumes that the stress in the assembly of reinforcement and plate does not vary across the thickness. In actual reinforcements one may expect large variation in the stress in the thickness direction near rivets and at points where the thickness changes rapidly.

It was decided, therefore, to check the theory by tests on a large plate with a hole reinforced by riveted circular doubler plates. The elongation of the hole and the strain in the plate and reinforcement were measured as the specimen was subjected to uniform tension at the ends. The tests showed good agreement between measured and calculated values, provided at least two concentric rows or rivets were used to fasten the doubler plate to the specimen.

The results, which will be reported in full in the Journal of Applied Mechanics, indicate that the plane-stress theory can be applied to an analysis of double-plate reinforcement, provided that the reinforcement is properly attached to the plate.

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Battery Advisory Committee

A meeting was held at the National Bureau of Standards on January 24 to initiate a new Joint Battery Advisory Committee. This replaces the former Joint Army-Navy-NDRC Battery Advisory Committee, which proved invaluable during the war in coordinating the developments of the various services. The new committee consists entirely of Army and Navy personnel except for its chairman, G. W. Vinal, Chief of the Electrochemistry Section of the Bureau. The new committee is to undertake and to direct work of fundamental research in the development of the best types of batteries for various military uses.

Screw-Thread Standardization

A meeting of the Interdepartmental Screw Thread Committee, held at the Bureau on January 7, adopted a set of standard valve-outlet threads for compressed-gas cylinders. These standard threads had been systematically developed by the Compressed Gas Manufacturers' Association so as to insure interchangeability of connections for any given gas and to prevent cross connections among cylinders containing any of 28 different gases. This brings to a successful conclusion a standardization project that has been advocated by the Committee, and by its predecessor, the National Screw Thread Commission, for 25 years. It will, naturally, still require a considerable time to make the standard fully effective throughout the Government service and industry.

The Committee has decided to publish a supplement to Handbook H28 (1944), which will include the standard mentioned in the preceding paragraph, as well as the new list of uniform screw-thread symbols agreed upon by Great Britain, Canada, and the United States at Ottawa last October. Succeeding H. W. Bearce,

retired, D. R. Miller, chief of the Bureau's Gage Section, has been appointed as Department of Commerce representative on the Committee, and I. H. Fullmer, also of the Gage Section, has been chosen as its Secretary.

New and Revised Publications Issued During February 1946

Research Papers [1]

(Reprints from October and November 1945 Journal of Research)

RP1674. Hysteresis in the physical adsorption of nitrogen on bone char and other adsorbents. Leland F. Gleysteen and Victor R. Deitz. Price 5 cents.

RP1675. Some physical properties of mica. Peter Hidnert and George Dickson. Price 10 cents.

RP1676. Determination of the purity of hydrocarbons by measurement of freezing points. Augustus R. Glasgow, Jr., Anton J. Streiff, and Frederick D. Rossini. Price 10 cents.

RP1679. Impact strength of nylon and of sisal ropes. Sanford B. Newman and Helen G. Wheeler. Price 5 cents.

RP1680. Oxidation of galacturonic acid and of 5-ketogluconic acid in alkaline solution. Horace S. Isbell and Nancy B. Holt. Price 5 cents.

Building Materials and Structures Reports [1]

(Persons who wish to be notified of new publications in the Building Materials and Structures series as soon as they are available, should write to the Superintendent of Documents, Government Printing Office, Washington 25, D. C., asking that their names be placed on the special mailing list maintained by him for this purpose.)

[1] Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, $3.50 per year (to addresses in the United States and its possessions and to countries extending the franking privilege); other countries, 70 cents and $4.50, respectively.

BMS105. Paint manual with particular reference to Federal Specifications. Percy H. Walker and Eugene F. Hickson. Price $1.00, blue buckram. (Handbook size, 5¼ by 7¾ inches.)

Technical News Bulletin [1]

Technical News Bulletin 346, February 1946. Price 5 cents. Annual subscription, 50 cents.

Mimeographed Material

Letter Circulars

(Letter Circulars are prepared to answer specific inquiries addressed to the National Bureau of Standards and are sent only on request to persons having a definite need for the information. The Bureau cannot undertake to supply lists or complete sets of Letter Circulars or send copies automatically as issued.)

LC813. Dampness in basements and ground floors.

LC816. Simplified Practice Recommendations; Alphabetical list revised to February 1, 1946. (Supersedes LC794.)

LC817. Fluorescent lamps. (Supersedes LC652.)

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Recent Articles by Members of the Bureau's Staff Published in Outside Journals [2]

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[2] These publications are not obtainable from the Government. Requests should be sent direct to the publishers.

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